

[0109] FIG. 14a illustrates an exemplary mobile telephone 1136 that can include touch sensor panel 1124, haptic system 1100, display device 1130, and other computing system blocks that can be utilized for providing haptic feedback.

[0110] FIG. 14b illustrates an exemplary digital media player 1140 that can include touch sensor panel 1124, haptic system 1100, display device 1130, and other computing system blocks that can be utilized for providing haptic feedback.

[0111] FIG. 14c illustrates an exemplary personal computer 1144 that can include touch sensor panel (trackpad) 1124, haptic system 1100, display 1130, and other computing system blocks that can be utilized for providing haptic feedback.

[0112] The mobile telephone, media player, and personal computer of FIGS. 14a, 14b and 14c can improve the user experience by providing haptic feedback according to embodiments of the invention.

[0113] Although embodiments of this invention have been fully described with reference to the accompanying drawings, it is to be noted that various changes and modifications will become apparent to those skilled in the art. Such changes and modifications are to be understood as being included within the scope of embodiments of this invention as defined by the appended claims.

What is claimed is:

1. A haptic feedback device comprising:
  - a plurality of controllable nodes disposed between a first and a second surface, the controllable nodes being configured to change between transmission states and a non-transmission states so as to provide a localized haptic response in discrete regions of the first surface when the second surface is powered with a haptic signal.
2. The haptic feedback device of claim 1, further comprising a haptic signal generator configured to produce the haptic signal, the haptic signal generator being operatively coupled to the plurality of controllable nodes through the second surface.
3. The haptic feedback device of claim 1, wherein the controllable nodes are placed proximate and edge of the first surface.
4. The haptic feedback device of claim 1, wherein the controllable nodes are disposed around the perimeter of the first surface.
5. The haptic feedback device of claim 4, wherein some of the controllable nodes are disposed on a first side of the first surface and some of the controllable nodes are placed on a second side of the first surface, and wherein the controllable nodes on opposing sides are aligned with one another, each of the opposing controllable nodes forming a haptic path for the haptic signal at the first surface.
6. The haptic feedback device of claim 5, wherein a first set of nodes are aligned in a first direction, and a second set of controllable nodes are aligned in a second direction, the first and second directions being transverse to one another such that they intersect, the intersection of the haptic paths creating a haptic output region where the haptic signal can be felt by a user.
7. The haptic feedback device of claim 1, wherein the controllable nodes are configured to dampen the haptic signal to the first surface thereby creating the transmission and non transmission states.

8. The haptic feedback device of claim 1, wherein the controllable nodes are configured to decouple the haptic signal to the first surface thereby creating the transmission and non transmission states.

9. The haptic feedback device further comprising a haptic controller that receives a signal indicating a location of an object near or at the first surface, and that selectively controls the controllable nodes to produce the localized haptic response at the location of the object relative to the first surface.

10. The haptic feedback device of claim 1 wherein the first surface is configured as a touch sensor panel.

11. The haptic feedback device of claim 1, wherein each node comprises:

a movable bar; and

an electromechanical device attached to one end of the movable bar and configured to rotate the movable bar, the electromechanical device having a plurality of states, wherein the transmission state is a rigid state at which the other end of the movable bar is in direct contact with the surface and the non-transmission state is a loose state at which the other end of the movable bar is away from the surface.

12. The haptic feedback device of claim 1, wherein each node comprises:

a flexible bar having a plurality of states, the transmission state being rigid in which the flexible bar is in contact with the surface and the non-transmission state being loose in which the flexible bar is away from the surface; and

an electromechanical device attached to the flexible bar and configured to trigger a particular state in the flexible bar.

13. The haptic feedback device of claim 1, wherein each node comprises:

a dynamic material having a plurality of states, wherein, in the transmission state, the material is rigid and, in the non-transmission state, the material is loose.

14. The haptic feedback device of claim 1, further comprising a waveguide configured to transmit the haptic signal from the nodes in the transmission state to specific regions of the first surface.

15. A touch sensitive device with a haptic system, comprising:

a surface;

a sensor arrangement configured to detect a location of an object in close proximity to the surface;

a haptic signal generator configured to produce a haptic signal when an object is detected; and

a plurality of haptic transmission nodes positioned at different locations relative to the surface, the haptic transmission nodes being configured to receive the haptic signal from the haptic signal generator, and to change states in order control the transmission of the haptic signal to the surface, the haptic transmission nodes associated with the location of the object substantially transmitting the haptic signal to the surface, the haptic transmission nodes not associated with the location of the object substantially not transmitting the haptic signal to the surface.

16. The device of claim 15, wherein the haptic transmission nodes are positioned at different locations around a perimeter of the surface.